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LEONARD W. WING, Editor

CONTENTS, FALL 1952

	Page
GUEST EDITORIAL: The Foundation for the Study of Cycles	137
THE 9 2/3-YEAR RHYTHM IN RAINFALL	140
THE 14 2/3-YEAR CYCLE IN THE NUMBER OF STRIKES IN THE UNITED STATES	150
FELLOWSHIP AWARDED TO LEONARD W. WING	152
STANDARD MONTH NUMBERS	153

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GUEST EDITORIAL

The Foundation for the Study of Cycles

About 3,000 scientists, the world over, have devoted part of their energies to the study of rhythmic fluctuation. Usually these studies have been merely incidental to their main field of interest. Thus, a mammalogist, interested in mink, let us say, or in game preservation, might write a paper on the rhythmic cycles in the abundance of wild life; a geologist might notice that every so many years thicker layers of sedimentary rock were deposited; an economist might observe a tendency for the ups and downs of prices or production to come at reasonably regular time intervals. All in all, workers in about thirty-six different branches of natural and social science have concerned themselves with rhythm.

Regularity Gives Predictability

One reason for their interest is a very practical one. When we have non-random regularity we have the beginning of predictability. If mice, for example, tend to be much more numerous at four-year intervals, as they are in Eastern United States, mouse plagues can be forecast and preventive measures can be taken by the farmers and others concerned. If grouse tend to die out at six-year intervals, as they do in Scotland, game conservation measures can be planned in advance of the decline; conversely, unlimited shooting can be permitted at times of abundance. And if any of the ups and downs of business tend to come at reasonably regular time intervals, a knowledge of this fact can be used to help stabilize our economy.

Rhythmic Fluctuations Pose a Challenge

A second reason for the interest of scientists in rhythmic fluctuation is the challenge posed by behavior of this sort. Why do things behave this way? At present, in most instances, no one knows. Unsolved mysteries are one of the forces that drive scientists forward.

Identical Wave Lengths Suggest Possible Causal Interrelationships

The third reason for scientific interest in rhythm is the hope that the rhythms themselves may help provide the answer to the very questions they pose. For example, if Canadian lynx have a cycle of abundance of 9.6 years, as they do, it may throw light on the cause of this cycle when Professor Huntington of Yale discovers a 9 2/3-year cycle in the abundance of ozone, with peaks and valleys in the abundance of ozone coming a little ahead of corresponding peaks and valleys in the abundance of lynx. Perhaps the quantity of ozone in the air is related to the food supply or the reproductivity of the lynx. Or perhaps both ozone abundance and the reproductivity of lynx are influenced by some third factor.

A Clearinghouse Needed

As yet no one knows the answer, but an inter-change of knowledge of cycle length and cycle timing gives **hints** which can be obtained in no other way--hints which, when run down and verified, may throw a great deal of light on the problems of many aspects of science. These hints could never arise out of the work of any one discipline. These hints can logically be expected to come only from a central clearing house, which keeps track of cyclic research everywhere and itself conducts research into rhythmic behavior where such research is necessary to fill in the gaps, and which helps to develop techniques.

It was the need for such a clearinghouse and such cycle research that lay behind the creation, in 1940, of the Foundation for the Study of Cycles--a not-for-profit scientific and educational institution with offices in New York City and in East Brady, Pennsylvania. (The Foundation is a reorganization of the permanent committee created at the First International Conference of Biological Cycles, held at Matamek, In Canada, in 1931.)

Foundation Justified--Examples

In the twelve years of its existence the Foundation has justified the faith of its founders many fold. For example, the Foundation has placed side by side the work of C. N. Anderson of the Bell Telephone Laboratories, who discovered a 14.8-year wave in sunspots with alternate cycles reversed; the work of F. A. Pearson of Cornell, who discovered a rhythm of seemingly this exact length in the price of pepper and in the purchasing power of beef cattle; the work of A. E. Douglass of the University of Arizona who finds what seems to be the same rhythm in the alternate thickness and thinness of tree rings; and the work of D. D. Miner of the Chemical Bank of New York who discovered what seems to be a 14.8-year rhythm in interest rates. When this has been done, the Foundation discovers not only that the waves seem to be of exactly the same length, but that the crests of at least the Anderson, Pearson, and Douglass waves come at about the same time.

The 17 2/3 Year Cycle

Another example has to do with a 17 3/4-year wave discovered by the Foundation in tree rings, cotton prices, the sales of a large industrial concern, pig iron prices, the liabilities of commercial and financial failures, and sunspots

with alternate cycles reversed. Here again in most instances, not only are the lengths seemingly the same but the crests come at about the same time.

The 54 Year Cycle

A third example is the 54-year rhythm discovered by Sir William Beveridge in British wheat prices throughout the past 300 years and observed by N. D. Kondratieff in French rente and English consols, in wages, and in the production of coal, pig iron, and lead in England, and in prices in France, England, and the United States. The Foundation has extended Beveridge's work back for an additional 500 years and has also found average waves of this length in Arizona tree rings back for 1086 years.

The 18 1/3 Year Cycle

A fourth example has to do with an 18 1/3-year rhythm discovered by Anderson in sunspots with alternate cycles reversed, by H. P. Gillette in the alternate thickness and thinness of rock strata, and by Roy Wenzlick in the national index of real estate transfers and in marriages per 100,000 adult males in St. Louis. Professor Pearson has observed a rhythm of about this length in building construction and many other aspects of our economy including wheat acreage in New York, pig iron production, loans and discounts, and railroad stock prices. The Foundation itself has discovered this rhythm in the sales of a large industrial company and the sales of a large public utility. As far as known, all crests come at about the same time.

The 41 Month Cycle

A fifth example has to do with the 41-month rhythm so general in American industry and prices, and found by Ellsworth Huntington in the variations of atmospheric electricity.

The 9.6 Year Cycle

Sixth, Huntington's discovery of a 9.6-year cycle in the abundance of ozone corresponding to the abundance of Canadian lynx has already been mentioned. A rhythm of seemingly this same length has been found by Charles Elton of Oxford in the abundance of marten, mink, and muskrat in Canada; by E. B. Phelps and D. L. Belding in the abundance of Atlantic salmon; and by V. E. Shelford and W. P. Flint in the abundance of chinch bugs. Huntington also discovered a rhythm of this length in the incidence of human heart disease in northeastern United States; the Foundation finds a rhythm of this length in rainfall in India.

The Six Year Cycle

And, even at the risk of laboring the point, I shall give a seventh example. A six-year rhythm, first discovered by Chapin Hoskins in lard prices and in the sales of a large industrial concern, has been discovered by the Foundation in the production of rayon, in the production of automobiles, in barometric pressure at New York, in cotton prices and cotton production, in the sales of some 25 of our leading corporations (but not in the sales of certain others) and in sunspots with alternate cycles reversed. It also seems to be present in tree rings in Arizona for the last 1086 years.

Now what this all adds up to is the suggestion that perhaps in our environment are forces that up to now have been as unsuspected as were germs in the days before Pasteur The fact that we have rhythms that seem to have the same length in different phenomena suggests the possibility of a common cause. The fact that for any given wave length the crests and lows often correspond in timing fortifies the suggestion. The fact that these rhythms are present both on the sun and on earth suggests the possibility that the causative force may be in the sun, or may be in space and affect both the sun and ourselves.

The Implications

If such forces do exist--and who can doubt the possibility when one sees many unrelated things fluctuating with rhythm of common wave length--the implications are enormous. When the laws governing these behaviors have been worked out it may be possible to throw light on the coming of epidemics, on future weather conditions, on the future abundance of wild life and on the future flow of streams and watersheds. More important, if these forces affect human beings, as they seem to, we find ourselves at the very core of the problem of depressions. If depressions are not caused by businessmen, as the mass of the people believe, but are the result of natural physical environmental forces, the making of such facts known is a public service of the highest order.

Achievements

In addition to drawing together the cycle work of many fields, in its twelve years of existence the Foundation has created the Journal of Cycle Research which you are now reading, has published a Directory of workers in this field, has published the first of thirty-six sections of a digest of all work in the field; has compiled a bibliography and established a library, has prepared the material from which the Director and a co-author were able to write a book called **Cycles The Science of Prediction**, and has published some thirty-seven reprints of material in regard to cycles, believed to be of general interest. In addition, it has conducted a great deal of research work, which is being put into shape for publication as fast as possible. This research is being issued in the form of reports; some of which have already been published; 200 more are projected. It is believed that the publication and dissemination of

these reports will be of important scientific and practical value.

Thus, in these and in other ways, the Foundation has helped to draw together the work of many of the natural and social scientists who are concerned in one way or another with rhythm. It is hoped that from such coordination there will come results of benefit to all mankind.

Edward R. Dewey, Director
Foundation for the Study of Cycles

THE 9 2/3-YEAR RHYTHM IN RAINFALL

RIHAND AND SONE RIVER WATERSHEDS

UNITED PROVINCES, INDIA

1903 — 1947

By Edward R. Dewey

DIRECTOR, FOUNDATION FOR THE STUDY OF CYCLES

WITH THE ASSISTANCE OF NEWELL B. SAFFORD

Summary and Conclusions

1. Rainfall in the Rihand River watershed, United Provinces, India, 1924—47, shows evidence of a rhythmic fluctuation with a period of about 9 2/3 years and an average amplitude in the smoothed figures of about 13.8% of trend. There are, however, only two repetitions of this wave.

2. Some correspondence is found between the rainfall in the Rihand River watershed and rainfall in the Sone River watershed of which it is a part.

3. Rainfall in the Sone River watershed, 1903—47, evidences the same 9 2/3-year fluctuation as is present in the rainfall of the Rihand River watershed. Available figures provide four and a half repetitions of the wave. The average amplitude of the wave in the smoothed figures of the Sone River watershed is about 12.2%.

4. Rainfall in the Sone River watershed, 1903—47, also shows evidence of an important undulation 30 years or perhaps 35 years in length, but this wave is not visible in the figures of the rainfall of the Rihand River watershed.

5. Analysis of the rainfall of the Sone River watershed shows evidence of other concurrent rhythmic fluctuations, but they are not reported upon in this study. Whether they are also present in the rainfall of the Rihand River watershed is not known.

Introduction

From a report by Ismail Işmen in the files of the Foundation for the Study of Cycles it is learned that a dam is to be built on the Rihand River in the United Provinces, India.* (Fig. 1.)

The Rihand River is an important tributary of the Sone River which, in its turn, is a tributary of the Ganges. (Fig. 2.)

In connection with plans for the construction of the proposed dam it is important to throw light on the probable future rainfall for the Rihand watershed, year by year, for as many years in advance as possible.

One way in which this can be done is to discover if there are patterns or rhythms in the fluctuation of the rainfall in past years that have occurred so many times and with such regularity that they cannot easily be the result of random forces. If such rhythms are found they should be taken into account as possibilities for the future.

Unfortunately, records of the rainfall of the Rihand River watershed are available only from 1924 to 1947,* a period much too short for the determination of major rhythmic climatic fluctuations.

However, records of the rainfall of the Sone River watershed, of which the Rihand River watershed is a part, are available from 1903 to 1947.* Analysis of these 45 years of data are much more likely to be fruitful. And, if there is correspondence between the two watersheds, such analysis may throw some light upon the problem at hand.

The data, as given by Işmen, are recorded in Table 1 and, smoothed by 2-year moving averages** to minimize the effect of short-term fluctuations, are plotted in Figs. 3 and 4. It is obvious by inspection that there is some correspondence between the rainfall of the two watersheds.

This being so, it seems worthwhile to see if there are any patterns in the rainfall of the Sone River watershed that have recurred so regularly and so many times that they should be taken into account as possibilities for the years to come.

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*Işmen, Ismail, **Hydrological Cyclic Analysis**, San Francisco, 1949.

**The smoothing was effected by means of the formula:

$$MA_b = \frac{\frac{1}{2}a + \frac{1}{2}c}{2}$$

where MA_b stands for the moving average of b, and a, b, and c represent successively every three consecutive terms of the series with b, of course, the middle term of the three.

For a discussion of moving averages consult Dewey, Edward R., **Cycle Analysis: The Moving Average.** Technical Bulletin No. 4, Foundation for the Study of Cycles, New York, New York, 1950.

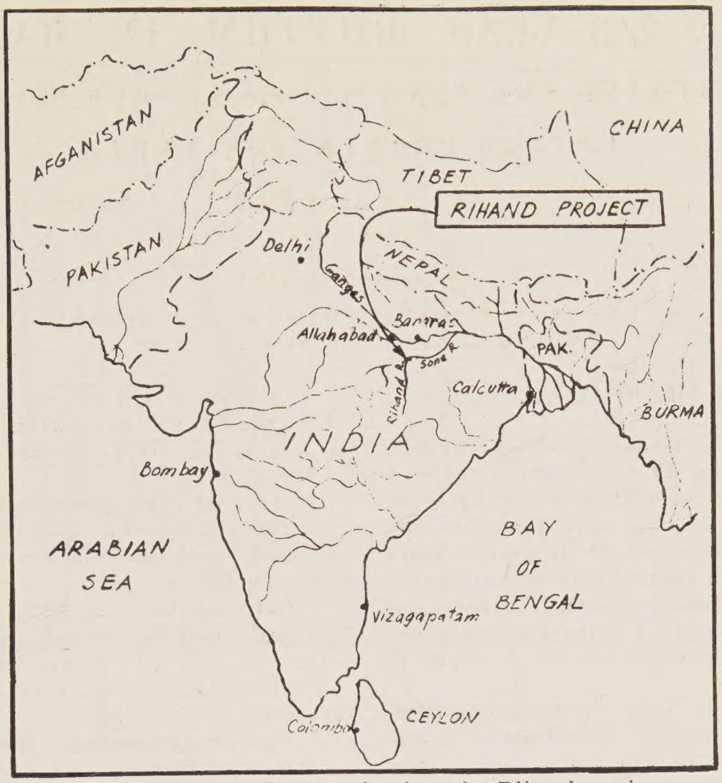

Fig. 1. Map of India, showing the Rihand project.

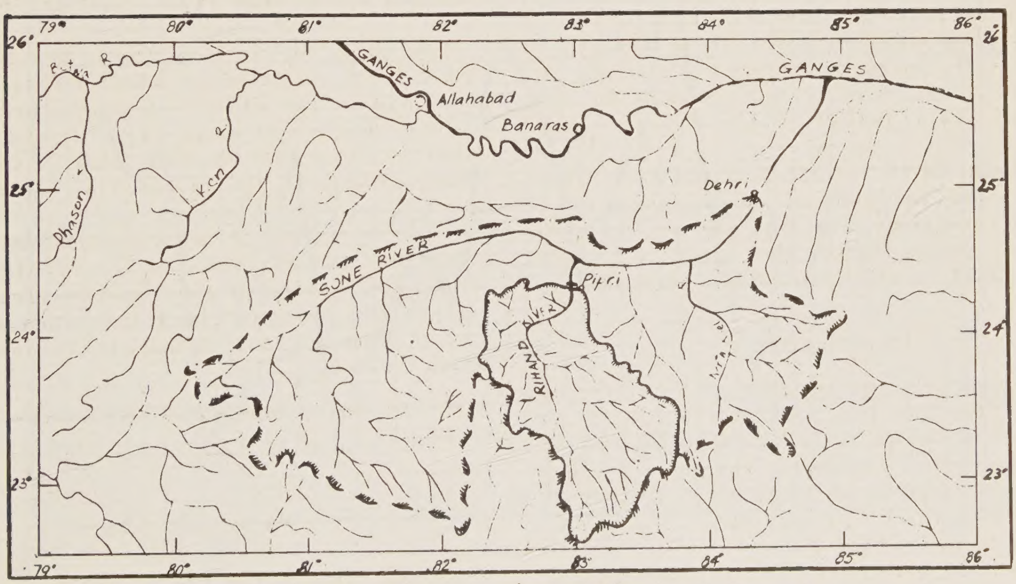

Fig. 2. Map showing watersheds of the Rihand and Sone Rivers, India.

From: Işmen, Işmail, **Hydrological Cyclic Analysis**, San Francisco, 1949

Fig. 3. Annual rainfall, Rihand watershed, 1924—47,
smoothed by a centered 2-year moving average.

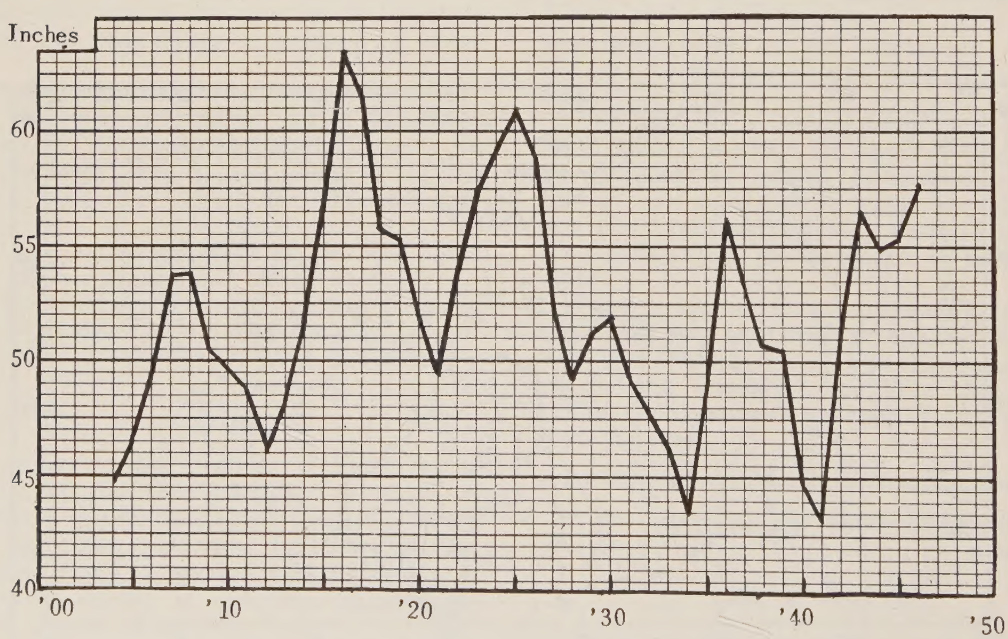

Fig. 4. Annual rainfall, Sone watershed, 1903—47,
smoothed by a centered 2-year moving average.

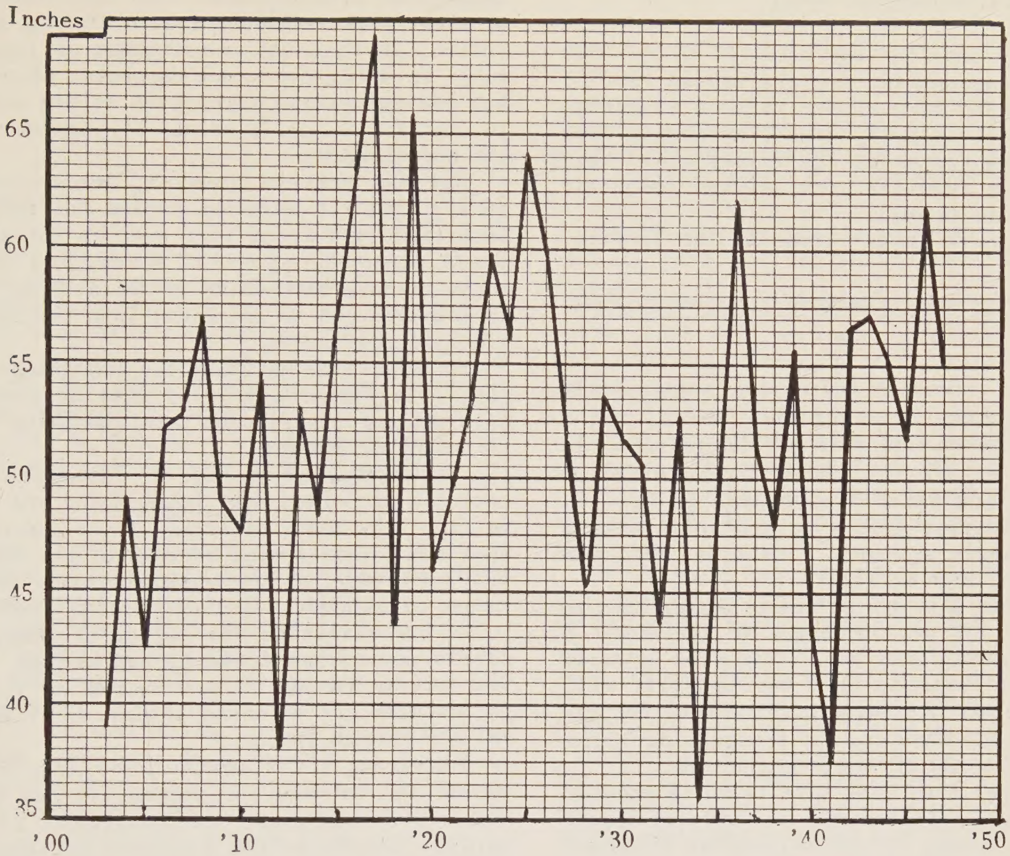

Fig. 5. Annual rainfall, Sone watershed, 1903—1947, unsmoothed.

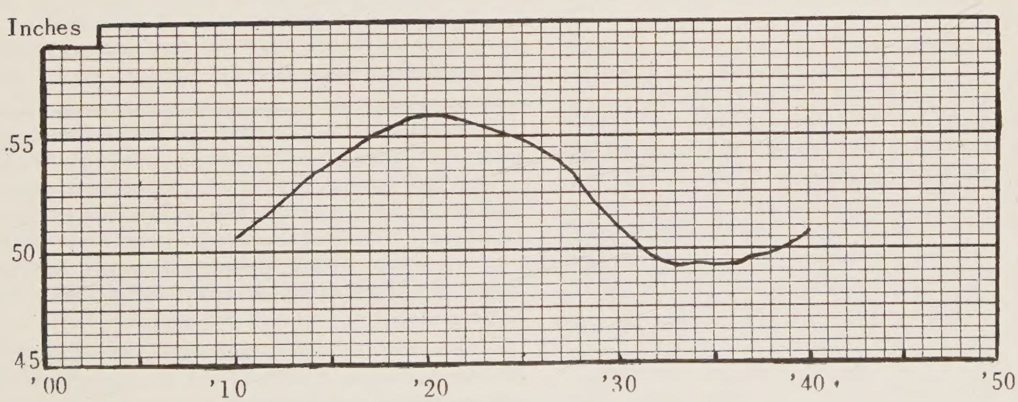

Fig. 6. Annual rainfall, Sone watershed, 1903—1947, smoothed by the 15-term moving average discussed in the test.

Analysis—Sone River

The actual data for the rainfall in the Sone watershed, unsmoothed, are charted in Fig. 5. At First glance they appear to be a higgledy-piggledy collection of values, as indeed they are, for they represent the interplay of many random forces together with several seemingly rhythmic forces as well.

Let us smooth these values by the formula:

$$MA_h = \frac{a+3b+5c+7d+9e+11f+12g+12h+12i+11j+9k+7l+5m+3n+o}{108}$$

where a to o represent successively every fifteen consecutive terms of the series, and h represents the middle term of the fifteen In this way we obtain the values shown in Col. E of Table 1, and which are charted in Fig. 6. An underlying wave with a period* of about 30 years is clearly apparent. Lows exist at 1905½ and 1935½, the high at 1920½.

The smoothed data are so few in number that we have visible but one occurrence of the wave. A single isolated fluctuation gives no grounds whatever for assuming that the behavior will repeat. From the data alone, therefore, the existence of this wave has no forecasting value except in the sense of purest conjecture.

On the other hand the wave is quite regular and corresponds quite closely not only in length but also in timing to the well-known Bruckner cycle which averages about 35 years in length, first reported upon three and a half centuries ago by Sir Francis Bacon.**

We should therefore consider our smoothed figures as probably more than a hint of a wave of about this length, and make further investigation, through the measurement of local tree rings or sedimentary rock deposits, to see if it has had successive repetition in the past, and to discover as nearly as may be its exact length and normal timing.

For the present however, let us consider merely that the original series has been characterized by a trend that went up for about 15 years, down for about 15 years, and latterly seems to have been going up again. This 30-year fluctuation can be projected into the future on a conjectural basis.

It is easy to estimate the approximate shape that this basic underlying wave or trend must have had for its fifteen term smoothing to have the shape of charted

the shape charted in Fig. 6. These values are recorded in Column B of Table 2 and are plotted in Fig. 7 by means of broken lines superimposed upon the 2-year moving average of the raw data. The amplitude of the wave accounts for 4.95 inches of rainfall; the dates are as given above.

We now eliminate the effect of this tentatively determined trend by expressing the 2-year moving average as percentages of it. These percentages are recorded in Col. C of Table 2 and are plotted in Fig. 8

Analyzing these percentages for rhythmic repetition reveals the possibility of several concurrent rhythms, the interplay of which largely describes the recorded pattern. This report, however, will deal with but one—a rhythm of about 9 2/3 years in length.

Periodogram Analysis

A rhythm or beat of about nine or ten years in length can be observed by simple inspection of the 2-year moving average of the raw data as plotted in Fig. 4, or the percentages of trend, plotted in Fig. 8

The possible existence of a wave with a period or length of about nine or ten years suggests the construction of a partial periodogram.*** Periodo-

*The **period** of a wave is the time required for one complete oscillation, as from the top of one crest to the top of the next, or from the bottom of one trough to the bottom of the trough next following.

Bacon, Sir Francis (1560–1626), as quoted in Huntington, Ellsworth, **Mainsprings of Civilization, New York, 1945, p. 455. "There is a toy that I have heard, and I would not have it given over, but waited upon a little. They say it is observed in the Low Countries (I know not in what part), that in every five and thirty years the same kind and suit of years and weathers come about again; as great frosts, great wet, great drought, warm winters, summers with little heat, and the like, and they call it the prime; it is a thing I do the rather mention, because, computing backwards, I have found some concurrence."

Huntington also tells, on the same page, how Bruckner gave his name to this cycle. By his "data of wheat harvest and wine making, the freezing of rivers and their opening to navigation in the spring, the rise and fall of enclosed lakes like the Caspian Sea, and other natural occurrences, mainly in Europe. . he showed clearly that the weather in Europe varies definitely in cycles with an average length of about 35 years. . .the length of the cycle ranges from 17 to 50 years but departures from the normal balance one another and the maxima . . . average about 35 years apart." See Bruckner, Eduard, **Klimaschwankungen seit 1700**, Vienna, 1890.

*** The term periodogram was introduced by Sir Arthur Schuster (1851–1934) to describe a method of harmonic analysis developed and applied by him in a number of papers.

For a simple description of the periodogram and periodogram analysis see Croxton, Frederick E., and Cowden, Dudley J., **Applied General Statistics**, Prentice-Hall, Inc., New York, 1941.

For a more mathematical treatment see Davis,

gram values from T = 9 1/3 years to T = 10 years are given in the following table:

PERIOD IN YEARS	MEAN AMPLITUDE
9 1/3	9.4%
9 2/3	11.0%
10	9.9%

As there is greater strength at T = 9 2/3 years than at either T = 9 1/3 years or T = 10 years, the possibility of an average wave at or about the middle length is indicated.*

Strength in a periodogram for any particular value of T denotes average strength for that period. It does not necessarily denote rhythm or successive strength. To make sure that there is a rhythm involved at about T = 9 2/3 years we must, as far as possible, avoid all mathematical averaging and consider each wave separately.

Rhythm Analysis

One way to make a rhythm analysis is by means of a Hoskins Time Chart. A 9 2/3-year time chart of the percentages is shown in Fig. 9.

The time chart is a method devised by Mr. Chapin Hoskins for diagramming the position in time of the "highs" and "lows" of any series of fluctuations.

Like a periodic table, a time chart divides time into sections. Each section is equal in length to the period of the suspected rhythm. In each of these sections the position in time occupied by each of the various highs and lows is indicated.

Mr. Hoskins has also devised an objective method of determining the highs and lows in any given series. Such a method is an integral part of any such analysis.

In a time chart, if rhythmic behavior is present, the highs and lows will tend to form a straight line. If the length of the rhythm is equal to the length of the section, the straight line will also tend to be a horizontal line.*

In the present instance the time chart indicates that from 1903 to 1947 there has in fact been a tendency for rhythm, with a wave length or period of about 9 2/3 years.

From the time chart we can note directly in regard to the eight turning points that, in the past, there has been the following behavior:

(a) Six of the eight turning points have come exactly at median* timing.

(b) Of the two distorted turning points one was one year and one three years from median timing.

(c) All turning points show full standard clearspan** of 5 or more except the first, in 1907, for which year the exact clearspan number is not known.

(d) No high has ever been lower than 110.3% of trend; from there they have gone up to 117.0% of trend, with a median value of 113.8% of trend.

(e) No low has ever been higher than 88.4% of trend; from there they have gone down to 84.3% of trend.

We may also note, but not from the time chart, that the average median*** value of highs and lows at the ideal time as shown by the dotted lines in Fig. 8 is 111.7% for highs and 87.3% for lows. These are the values above and below trend that will, on the average, characterize the 9 2/3-year wave of the 2-year moving averages of rainfall in the Sone river watershed in the future, if this behavior continues. Half of the difference between the high and the low gives us the amplitude, in this case 12.2%.

Harold T., **The Analysis of Economic Time Series,** the Principia Press, Inc., Bloomington, Indiana, 1941.

For a discussion of one way of computing a periodogram using a fractional arithmetic sequence, see Worthing, Archie S., and Geffner, Joseph, "The analysis of Non-Harmonic Periodic Functions", **Treatment of Experimental Data,** John Wiley & Sons, Inc. New York, 1943

The method ordinarily used by the author of this paper is similar to the method described by Worthing and Geffner but slightly more simple of application.

*See however, Dewey, Edward R., "Limitations of the Periodogram," **Cycles A Monthly Report,** June 1951, pp. 229—232.

For a more complete description of the Time Chart, of the method of determining highs and lows, and of the ways of setting up and interpreting the diagram, see Dewey, Edward R., **A Description of the Hoskins Time Chart, Technical Bulletin *1. 3, Foundation for the Study of Cycles, Riverside, Conn., 1949.

*The median for an odd number of terms is the middle term of the series when all the terms are arranged in order of size. For a series of figures that contain an even number of terms it is the average of the two middle terms when all terms are arranged in order of size.

**Clearspan is the number of time units (in this instance years) less 1, since, in a descending sequence, there has been a value as low, or lower, or, in an ascending sequence, there has been a value as high or higher. Clearspan numbers in a descending sequence are recorded in black. By a descending sequence we mean, of course, a situation when the value for a given year is less than the value for the year before. By an ascending sequence we mean the reverse—that is, where the value for a given year is greater than the value for the year next preceding.

***The average median is an average of several of the middle values when all terms are arranged in order of size. In other words, the mean or arithmetic average of all the terms excluding a certain number of the highest and lowest terms.

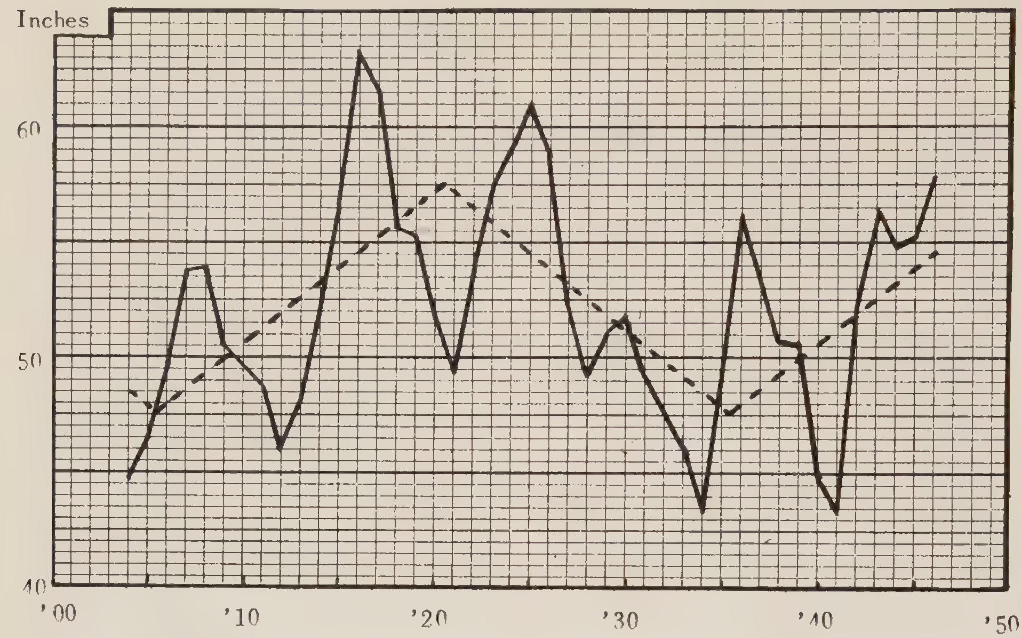

Fig. 7. Annual rainfall Sone watershed, 1903—1947, smoothed by a centered 2-year moving average. Broken line, a 30-year wave.

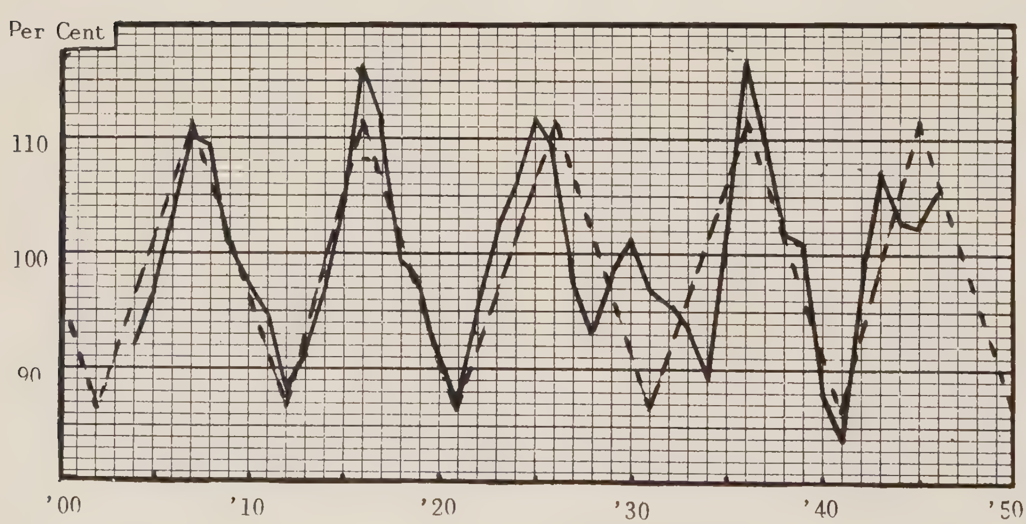

Fig. 8. Percentages that the smoothed data are of the 30-year wave. Broken line, a 9 2/3 (9, 10, 10-year wave with lows 5 years after crests.

Trend

As stated earlier, the figures from 1903 to 1947 have been characterized by an undulation shown to be about 30 years in length.

From an examination of Fig. 8, however, we note that the percentages for the trough of 1941 are somewhat lower than usual, and that the percentages for the high area in the general neighborhood of 1945 are also lower than usual.

These facts could be the result of individual cyclic variation, but would seem more probably to be a change in the characteristics of the underlying oscillating trend.

If we adjust the series for the effect of a perfectly regular 9 2/3-year wave (for convenience assumed to be 9, 10, and 10 years respectively *), just as we would adjust a series of monthly figures for seasonal variation, we obtain as a residual the 30-year wave, and all other rhythmic and random factors in combination.

From these values we see clearly that the current 30-year wave is not rising anywhere nearly as fast as the wave from 1905½ to 1920½, and that perhaps the current wave will have a length of about 35 years or more instead of the length of 30 years that characterized the data from 1903 to 1947.

Rihand River

The analysis of the rainfall of the Sone River watershed adds some significance to the 9- to 10-year fluctuations of the Rihand River with which we started.

Assuming that these fluctuations may be a part of the same climatic conditions, we now have four and a half waves instead of two, with a consequent increase in the probability that the waves are not the result of random forces. Assuming the wave in the Rihand figures to be 9 2/3 years, we come up with the following facts:

The timing of the waves in the two series is the same. The average amplitude of the wave in the smoothed figures of rainfall in the Rihand watershed, however, is greater than in similar figures for rainfall in the Sone River watershed being 13.8%. The wave in the Rihand watershed, like its counterpart in the Sone, is quite regular, all of the five probable turning points coming within a year one way or the other of perfect timing.

If this behavior continues, we may expect the centered 9-year moving averages of future rainfall to show strength in the general neighborhood of 1955, 1965, 1974, 1984, and 1994 and weakness in the general neighborhood of 1960, 1970, 1979, and 1989.

Statistical Significance

No attempt has been made to evaluate the statistical significance of the rhythm disclosed. Four and a half waves of the regularity disclosed could easily have come about as a result of random forces. For convincing proof of significance, one must have a great many repetitions of a cycle. In this instance the available data are not numerous enough to enable us to know whether such additional repetitions have in fact existed.

Discussion

It is of more than passing interest that the length of 9 2/3-years corresponds to a cycle in animal abundance, established over a period of more than 200 years, and believed by some biologists to have a climatic cause.

The presence of a cycle of this length in the Sone Watershed for nearly 50 years should spur investigations of climatic conditions, as reflected by long series of tree ring width figures, to see if such a cycle is present over a long period of time, and in other parts of the world as well.

As for the application of the present study it should be noted:

First, that rhythmic variation in climatic phenomena have a way of fading out or reversing phase, so that highs come just when one would expect lows, or vice versa.*

Second, as stated above, the behavior shown could easily be the result of random forces.

Third, it must be pointed out, even if we assume that the rhythms will continue and that the distortions will continue as in the past, that the information classified above is only partial information and needs to be supplemented by other information, if such can be obtained, before it is used to help forecast future probabilities.

Fourth, it should be repeated that the analysis of these figures gave hints of other rhythmic fluctuations in the data. That is, the rainfall figures act as if they had been influenced simultaneously by a number of rhythmic forces (if we are entitled to postulate a force where we see a result) whose interplay has sometimes supplemented and sometimes offset each other.

These other rhythmic forces, if they prove to be present, may serve to explain many of the distortions from the ideal 9 2/3-year pattern. Thus for any given year it should be possible to

*See Dewey, Edward R., "Compound Cycles," in **Cycles—A Monthly Report**, December 1950, pp. 19-20.

*For this adjustment, we use the following values for years after base years 1903, '12, '22, '32, & 41.

Base Year	Years After Base Year 1	2	3	4	5	6	7	8	9	10
1903 & '32	95.4	100.9	106.3	111.7	106.3	100.9	95.4	90.0	90.0	——
1912, '22 & '41	97.1	101.9	106.8	111.7	106.8	101.9	97.1	92.2	87.3	92.2

project not only the ideal or average 9 2/3-year pattern and the underlying trend but two or more intertwining patterns as well. If these other rhythms are real--that is, if they are not the result of random forces—and if they continue, this composite projection can be expected to indicate the probabilities of any given future 9 2/3-year wave being higher or lower than average or with a crest or a trough that will come sooner or later than average.

Finally, the question arises as to the cause of this 9 2/3-year rhythm. In the present state of our knowledge, no one knows the answer to this perfectly legitimate question. However, if we take a leaf from the book of the engineers and make investigation to see what other phenomena have a rhythm of the same period, we may provide ourselves with facts from which it will be possible to advance a tenative hypothesis.

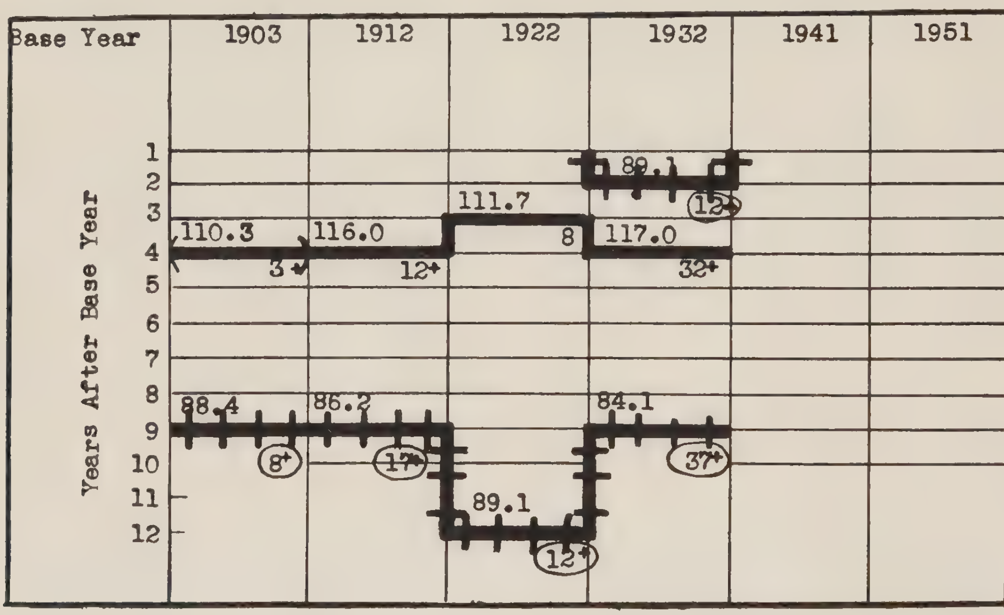

Fig. 9. Rainfall, Sone River Watershed, 1903-1947. A 9 2/3-year time chart of the percentages that the 2-year moving averages of the raw data are of the trend (V_5v_2).

A time chart is merely a skeletonized representation of the highs and lows, as objectively determined by a method cited in the text. In the chart solid horizontal lines represent the highs, ÷'ed horizontal lines represent the lows. (In work sheets color is used. The author uses red for lows and black for highs.) The numbers above the lines give the percentages for the years represented. The numbers below the lines give the "clearspan" numbers. Clearspan numbers for any given point represent the number of time units (in this instance, years less 1, since, in a descending sequence, there has been a value as low or lower, or in an ascending sequence, there has been a value as high or higher. Clearspan numbers in a descending sequence are recorded in red (here, circled), numbers in an ascending sequence are recorded in black. To fulfill standards, a high or a low of a 9 2/3-year wave must have a clearspan of five (V_5 or more. The fact that the solid and ÷'ed lines of the chart tend to fall in more or less of a straight horizontal line indicates the possible existence of a wave of about the length of the sections--in this instance 9 2/3 years (9 years, 10 years, 10 years). The fact of rhythm is indicated by the succession of highs and lows.

The low diagrammed at 1934 is inserted in two places: 2 years after base year '32 and also 12 years after base year '22 so that it can more conveniently be connected with the other lows.

The high at 1907 is placed in parentheses because we do not know for certain that this high had a clearspan of 5 or more.

The time chart provides hints of rhythm which may be present, and gives one measure of its regularity.

TABLE I. AVERAGE ANNUAL RAINFALL IN INCHES, RIHAND RIVER AND SONE RIVER WATERSHEDS, UNITED PROVINCES, INDIA, 1903–1947, TOGETHER WITH CERTAIN MANIPULATIONS OF THE DATA.

YEAR	A RIHAND RIVER RAINFALL*	B 2-YEAR MOVING AVERAGE OF "A"	C SONE RIVER RAINFALL*	D 2-YEAR MOVING AVERAGE OF "C"	E SMOOTHED DATA (SEE TEXT)	F ESTIMATED TREND 30-YEAR WAVE	G COL. D AS A PER CENT OF TREND
1903			38.9	--		49.30	--
1904			49.0	44.8		48.64	92.0
1905			42.4	46.5		47.98	96.8
1906			52.0	49.8		47.98	103.7
1907			52.8	53.7		48.64	110.3
1908			57.0	53.9		49.30	109.2
1909			48.8	50.5		48.96	101.3
1910			47.5	49.6	50.5	50.62	97.9
1911			54.5	48.7	51.2	51.28	94.9
1912			38.2	46.0	51.9	51.94	88.4
1913			53.2	48.3	52.6	52.60	91.7
1914			48.4	51.8	53.3	53.26	97.1
1915			57.0	56.5	53.9	53.92	104.7
1916			63.5	63.4	54.5	54.58	116.0
1917			69.4	61.5	55.0	55.24	111.2
1918			43.6	55.6	55.4	55.90	99.3
1919			65.9	55.3	55.7	56.56	97.7
1920			45.9	51.7	55.9	57.22	90.2
1921			49.1	49.4	55.9	57.22	86.2
1922			53.5	54.0	55.6	56.56	95.4
1923			59.8	57.3	55.4	55.90	102.4
1924	58.4	--	56.1	59.1	55.2	55.24	106.9
1925	62.1	64.1	64.2	61.0	54.8	54.58	111.7
1926	73.9	65.3	59.7	58.8	54.3	53.92	108.9
1927	51.5	54.7	51.7	52.2	53.7	53.26	97.9
1928	41.8	47.5	45.5	49.1	52.7	52.60	93.2
1929	54.8	49.5	53.6	51.1	51.7	51.94	98.3
1930	46.8	51.3	51.6	51.9	50.9	51.28	101.1
1931	56.8	53.1	50.6	49.1	50.2	50.62	96.9
1932	52.0	55.5	43.6	47.6	49.6	49.96	95.2
1933	61.2	57.7	52.6	46.2	49.4	49.30	93.6
1934	56.3	57.4	35.9	43.4	49.4	48.64	89.1
1935	55.7	60.2	49.3	49.2	49.3	47.98	102.4
1936	73.0	63.4	62.1	56.2	49.3	47.98	117.0
1937	51.9	58.6	51.3	53.0	49.6	48.64	109.1
1938	57.5	55.9	47.8	50.5	49.8	49.60	101.9
1939	56.5	53.1	55.6	50.5	50.1	49.96	101.0
1940	42.0	43.1	43.1	44.6	50.7	50.62	88.0
1941	32.0	41.6	36.5	43.2		51.28	84.1
1942	60.2	54.8	56.8	51.8		51.94	99.6
1943	66.7	64.3	57.1	56.5		52.60	107.3
1944	63.6	62.8	55.1	54.8		53.26	102.8
1945	57.3	59.6	51.9	55.2		53.92	102.3
1946	60.0	60.0	61.9	57.7		54.58	105.6
1947	62.6	--	55.1	--		55.24	--

*ISMEN, ISMAIL, HYDROLOGICAL CYCLIC ANALYSIS, SAN FRANCISCO, 1949, PP. 4-5.

Comment

The significance of this report lies in the fact that the length of the rhythm present in the rainfall of the Sone River watershed in India (9 2/3 years) may be identical with the length of the rhythm of abundance of Atlantic salmon, and of lynx, marten, rabbit, coyote, muskrat, mink, and other mammals in Canada. Moreover, turning points come at about the same time.

The facts disclosed by this report, added to the observations of Professor Ellsworth Huntington of Yale that death from human heart disease in Northeastern United States and the abundance of ozone at London and Paris also fluctuate with a rhythm of this length, strengthens the hypothesis of some biologists that the 9 2/3-year rhythm in animal abundance may have a climatic or other non-biological environmental cause.

Something makes ozone fluctuate with a 9 2/3-year rhythm. Now it appears that something has a similar effect upon rainfall in India. Perhaps this "something" affects other climatic factors and directly or indirectly, also affects human and animal life as well.

Do other climatic phenomena show a 9 2/3-year rhythm? Is a rhythm of this length present over long periods of time in tree ring widths? In magnetic variation? In the width of sedimentary rock deposits? In solar phenomena? No one knows, but the matter would seem to be worth investigating.

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American Museum of Natural History,
New York, New York.

THE 14 2/3-YEAR CYCLE IN THE NUMBER OF STRIKES IN THE UNITED STATES

BY EDWARD R. DEWEY

A rough rhythm or beat with a period or wave length of about 14 3/4 years is observable in the annual number of strikes in the United States, 1881—1951. See Fig. 1 and supporting figures in Table 1. This fact seems worth recording even though there is no assurance that the behavior has significance.

There are four reasons for questioning the significance of the repetitions.

First of all, four and a half repetitions of a rhythmic cycle can easily come about as a result of random forces.[1]

Second, there was a wave of strikes during and after World War I and another wave during and after World War II, just 29 years or two 14 3/4-year cycles later. Thus, two of the peaks upon which one must depend for one's notion of a 14 3/4-year wave were "war" peaks and may have been caused—at least in part—by a factor that had nothing to do with a 14 2/3-year cyclic force. The two or three remaining peaks may have just happened to fall into the major pattern set by the wars.

(On the other hand, there could be an error in the popular assumption that the strike peaks of 1917 and 1946 were war induced. These waves were no greater (relative to trend) than the wave of 1903 or the wave of '86—'90 when there was no war. Perhaps the wars just happened to fit into the cycle. Until we know more about cycles, no one will know, but a reasonable guess might be, if there is a 14 3/4-year cycle in the number of strikes, that the behaviors of 1916—20 and 1944—46 were partly the result of war and partly the result of cyclic forces.)

A fourth reason for not being too sure about a 14 3/4-year rhythm in the number of strikes is the fact that the low due in 1925 and the high due in 1932 were both much delayed. However it must be admitted that after the distortion the pattern snapped back into phase, as it always does when the wave is real.

Note however that there is a rhythm of about this length in a number of other phenomena. For example, Professor Pearson, of Cornell, has found a rhythm of about this length in pepper prices since 1860,[2] and in the purchasing power of beef cattle from 1890,[3] Anderson of the Bell Telephone Laboratories finds an average wave of about this length in sunspots with alternate cycles reversed from 1749,[4] Dewey finds a similar average wave in tree rings over very long periods of time.[5] Clayton finds it in sunspots,[6] and it has been found in other time series as well.

Measurements have not yet been made with sufficient accuracy so that you can be sure that the average lengths of the cycles in these various time series are identical, but the possibility is intriguing.

It is also worth noting that the time of the turning points is much the same, insofar as these times are known. For example, Anderson tells me that this wave in the sunspot series had an ideal top in 1901; the wave in the purchasing power of beef cattle had an ideal top in 1901; in black pepper prices in 1902; in strikes in 1903. (The date of the top of the average wave in tree ring widths is not known to me.) Such coincidence of timing is noteworthy, and adds importantly to the idea that we may be dealing here with something real.

In any event, it will be interesting to follow the course of strikes over the next 20 or 30 years to see whether or not the 14 3/4-year pattern in these figures continues.

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1. Dewey, E. R., "Cycles in Random Numbers," **Cycles—A Monthly Report**, Vol. III, No. 1, January 1952.

2. Pearson, F. A., Carsetta, Mrs. J. V., and Bennett, K. R., **Pepper**, Cornell University, Ithaca, New York, 1941.

3. Warren, G. F., and Pearson, F. A., **World Prices and the Building Industry**, John Wiley and Sons, Inc., New York, 1937.

4. Anderson, C. N., "A Representation of the Sunspot Cycle." **Bell System Technical Journal**, Vol. XVIII, pp. 292-299, April 1939.

5. Dewey, E. R. "Cycles in Tree Ring Widths, Lukachukai District, Arizona. Hint of a 14 3/4-Year Rhythm, 1100-1939." Unpublished Manuscript 1949.

6. Clayton, H. H., "The Sunspot Period," **Smithsonian Miscellaneous Collection**, Vol. 98, No. 2./

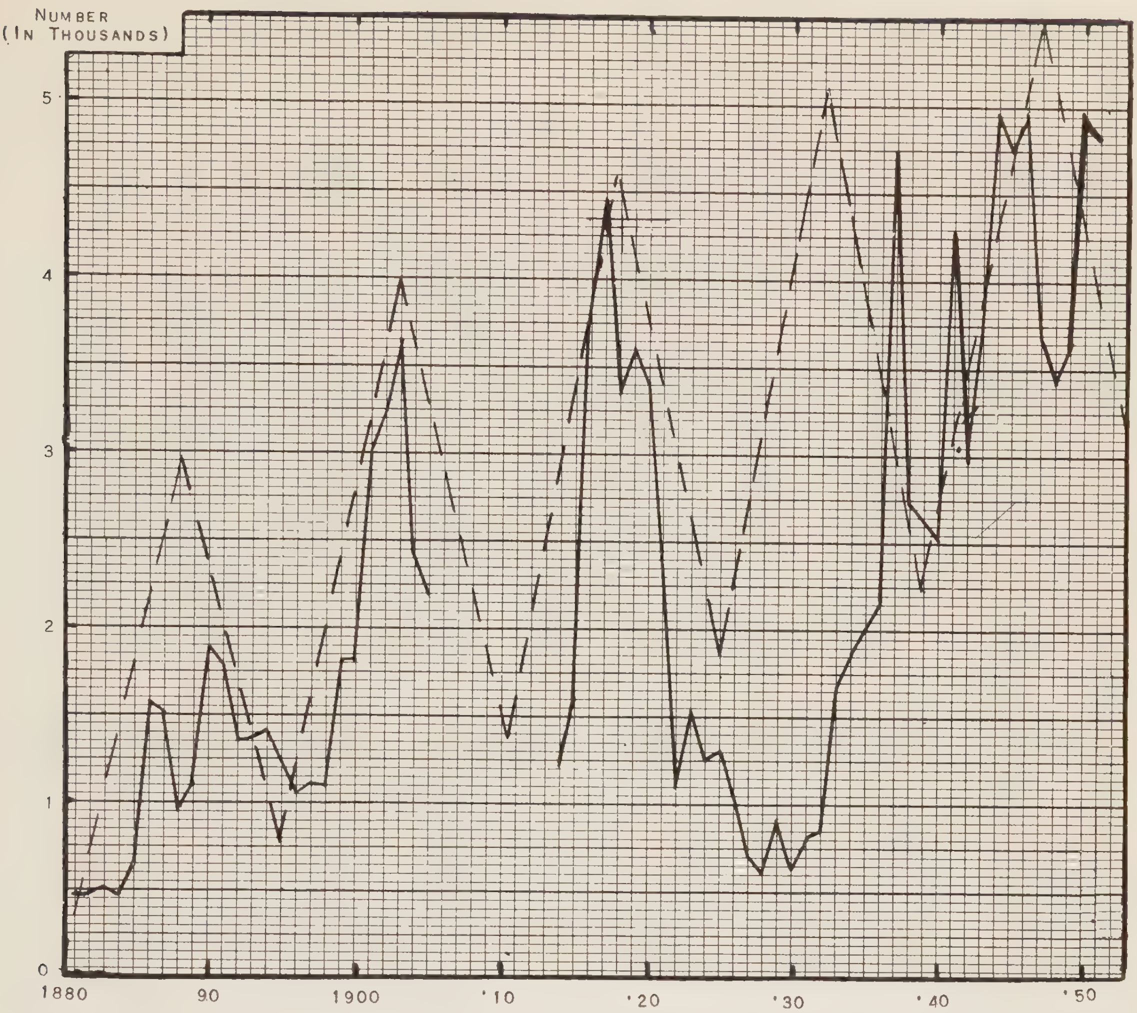

CHART SHOWING THE NUMBER OF STRIKES AND LOCK—OUTS IN THE UNITED STATES, 1881—1949.

A 14 2/3-YEAR CYCLE HAS BEEN ADDED BY MEANS OF A DOTTED LINE
THERE IS NO ASSURANCE THAT THE OBSERVED RHYTHM HAS SIGNIFICANCE

TABLE
STRIKES AND LOCK-OUTS IN THE UNITED STATES, 1881-1951

YEAR	NUMBER	YEAR	NUMBER	YEAR	NUMBER	YEAR	NUMBER	YEAR	NUMBER
1881	477	1896	1066	1911	*	1926	1035	1941	4288
1882	476	1897	1110	1912	*	1927	707	1942	2968
1883	506	1898	1098	1913	*	1928	604	1943	3752
1884	485	1899	1838	1914	1204	1929	921	1944	4956
1885	695	1900	1839	1915	1593	1930	637	1945	4750
1886	1572	1901	3012	1916	3789	1931	810	1946	4985
1887	1503	1902	3240	1917	4450	1932	841	1947	3693
1888	946	1903	3648	1918	3353	1933	1695	1948	3419
1889	1111	1904	2419	1919	3630	1934	1856	1949	3600
1890	1897	1905	2186	1920	3411	1935	2014	1950	4843
1891	1786	1906	*	1921	2385	1936	2172	1951	4650
1892	1359	1907	*	1922	1112	1937	4740		
1893	1375	1908	*	1923	1553	1938	2772		
1894	1404	1909	*	1924	1249	1939	2613		
1895	1255	1910	*	1925	1301	1940	2508		

*DATA NOT AVAILABLE.

SOURCES: 1881-1945, HISTORICAL STATISTICS OF THE UNITED STATES, 1789-1945, PAGE 73.

1946-1950, STATISTICAL ABSTRACT OF THE UNITED STATES, 1951, PAGE 206

1951, SURVEY OF CURRENT BUSINESS, FEBRUARY, 1952, PAGE S-13.

Fellowship Awarded To Leonard W. Wing

It is a pleasure to announce that the Fellowship for the year 1952—53 has been awarded to Dr. Leonard W. Wing, Professor of Wildlife Management at Texas A. & M.

Dr. Wing will move to Foundation Research Headquarters at East Brady, Pennsylvania and will commence his studies on September 1 of this year.

Dr. Wing was born at Grass Lake, Michigan on January 14, 1906. He received his A.B. at the University of Michigan in 1934 and his Ph.D. at the University of Wisconsin in 1937. He did post-doctoral work at Yale University, 1938—39. He was associated with the State College of Washington from 1939 to 1948 and the Agricultural and Mechanical College of Texas from 1948 to 1952. His non-academic activities include the following:

Field collector, Museum of Zoology (Michigan) 1926—1927

Field ornithologist, Kent Scientific Museum, 1927

Ornithology Assistant, Museum of Zoology (Michigan), 1931—1934

Research Assistant, University of Wisconsin, 1934—1937

Consulting Biologist, National Audubon Society, 1936

Biologist, Tennessee Valley Authority, 1937—1938

Chairman, Membership Committee, American Ornithologists' Union, 1945—1951

Member, Membership Committee, American Ornithologists' Union, 1944—1945

Member, Bibliographical and Biographical Committee, American Ornithologists' Union, 1931—1945

Member, Membership Committee, Wilson Ornithological Club, 1945—1951

Member, Employment Committee, Wildlife Society, 1940—1944

Member, National Research Council, Wildlife Society Planning Committee, 1944—1952

Associate Editor, Wilson Bulletin, 1931—1937

Editor, Journal of Cycle Research, 1950

His publications include almost 100 Journal papers and three books as follows;

Christmas Census Summary (processed) State College of Washington, 1947

Practice of Wildlife Conservation, John Wiley and Sons, Inc., 1951

Bird Biology, McGraw—Hill Book Company, (spring of 1953)

He is a member of the following societies:

American Ornithologists' Union
Society of American Foresters
Wilson Ornithological Club
Cooper Ornithological Club
Tree-Ring Society
Inland Bird Banding Association
Arctic Institute of North America
The Wildlife Society
Foundation for the Study of Cycles
Phi Sigma
Sigma Xi

We are very happy that Dr. Wing has decided to devote the coming year to an intensive study of cycle research.

STANDARD MONTH NUMBERS

A numerical system for designating months is almost indispensable in the cycle analysis of monthly data. Any system of consecutive numbers would do for the purpose.

The system of month numbers used by the Foundation for the Study of Cycles is printed below. It is an outgrowth of a system developed by Chapin Hoskins about 1935, Mr. Hoskins used December of 1900 as year 0. Mr. Hoskins's system has the advantage that the number for December of any year after 1900 is twelve times the number of that year in the present century. Thus, December of 1901 is 13, December of 1910 is 120, December of 1950 is 600. etc.

The Hoskins Standard Month Numbers were published on page 23 of **Cycles—A Monthly Report**, for September , 1950.

The Hoskins system of month numbers is ideal for short series of data but inadequate for figures going back into the nineteenth or eighteenth centuries.

For longer series of figures the Foundation has adopted month numbers with December of 1650 as 0. This system makes December of 1651, 12; December of 1700, 600; December of 1800, 1800; and December of 1900, 3,000.

From December, 1900, forward the Foundation numbers agree with the Hoskins numbers except that in all instances the Foundation numbers are 3,000 larger, For short series of figures starting after January of 1901, the 3,000 should be dropped and the simpler Hoskins numbers used instead.

Month numbers are almost indispensable for the computation of clearspan numbers, for time charts, for periodic tables, and for various other manipulations of monthly data.

E. R. Dewey

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1650												0
1651	1	2	3	4	5	6	7	8	9	10	11	12
1652	13	14	15	16	17	18	19	20	21	22	23	24
1653	25	26	27	28	29	30	31	32	33	34	35	36
1654	37	38	39	40	41	42	43	44	45	46	47	48
1655	49	50	51	52	53	54	55	56	57	58	59	60
1656	61	62	63	64	65	66	67	68	69	70	71	72
1657	73	74	75	76	77	78	79	80	81	82	83	84
1658	85	86	87	88	89	90	91	92	93	94	95	96
1659	97	98	99	100	101	102	103	104	105	106	107	108
1660	109	110	111	112	113	114	115	116	117	118	119	120
1661	121	122	123	124	125	126	127	128	129	130	131	132
1662	133	134	135	136	137	138	139	140	141	142	143	144
1663	145	146	147	148	149	150	151	152	153	154	155	156
1664	157	158	159	160	161	162	163	164	165	166	167	168
1665	169	170	171	172	173	174	175	176	177	178	179	180
1666	181	182	183	184	185	186	187	188	189	190	191	192
1667	193	194	195	196	197	198	199	200	201	202	203	204
1668	205	206	207	208	209	210	211	212	213	214	215	216
1669	217	218	219	220	221	222	223	224	225	226	227	228
1670	229	230	231	232	233	234	235	236	237	238	239	240
1671	241	242	243	244	245	246	247	248	249	250	251	252
1672	253	254	255	256	257	258	259	260	261	262	263	264
1673	265	266	267	268	269	270	271	272	273	274	275	276
1674	277	278	279	280	281	282	283	284	285	286	287	288
1675	289	290	291	292	293	294	295	296	297	298	299	300
1676	301	302	303	304	305	306	307	308	309	310	311	312
1677	313	314	315	316	317	318	319	320	321	322	323	324
1678	325	326	327	328	329	330	331	332	333	334	335	336
1679	337	338	339	340	341	342	343	344	345	346	347	348
1680	349	350	351	352	353	354	355	356	357	358	359	360
1681	361	362	363	364	365	366	367	368	369	370	371	372
1682	373	374	375	376	377	378	379	380	381	382	383	384
1683	385	386	387	388	389	390	391	392	393	394	395	396
1684	397	398	399	400	401	402	403	404	405	406	407	408

STANDARD MONTH NUMBERS—CONTINUED

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1685	409	410	411	412	413	414	415	416	417	418	419	420
1686	421	422	423	424	425	426	427	428	429	430	431	432
1687	433	434	435	436	437	438	439	440	441	442	443	444
1688	445	446	447	448	449	450	451	452	453	454	455	456
1689	457	458	459	460	461	462	463	464	465	466	467	468
1690	469	470	471	472	473	474	475	476	477	478	479	480
1691	481	482	483	484	485	486	487	488	489	490	491	492
1692	493	494	495	496	497	498	499	500	501	502	503	504
1693	505	506	507	508	509	510	511	512	513	514	515	516
1694	517	518	519	520	521	522	523	524	525	526	527	528
1695	529	530	531	532	533	534	535	536	537	538	539	540
1696	541	542	543	544	545	546	547	548	549	550	551	552
1697	553	554	555	556	557	558	559	560	561	562	563	564
1698	565	566	567	568	569	570	571	572	573	574	575	576
1699	577	578	579	580	581	582	583	584	585	586	587	588
1700	589	590	591	592	593	594	595	596	597	598	599	600
1701	601	602	603	604	605	606	607	608	609	610	611	612
1702	613	614	615	616	617	618	619	620	621	622	623	624
1703	625	626	627	628	629	630	631	632	633	634	635	636
1704	637	638	639	640	641	642	643	644	645	646	647	648
1705	649	650	651	652	653	654	655	656	657	658	659	660
1706	661	662	663	664	665	666	667	668	669	670	671	672
1707	673	674	675	676	677	678	679	680	681	682	683	684
1708	685	686	687	688	689	690	691	692	693	694	695	696
1709	697	698	699	700	701	702	703	704	705	706	707	708
1710	709	710	711	712	713	714	715	716	717	718	719	720
1711	721	722	723	724	725	726	727	728	729	730	731	732
1712	733	734	735	736	737	738	739	740	741	742	743	744
1713	745	746	747	748	749	750	751	752	753	754	755	756
1714	757	758	759	760	761	762	763	764	765	766	767	768
1715	769	770	771	772	773	774	775	776	777	778	779	780
1716	781	782	783	784	785	786	787	788	789	790	791	792
1717	793	794	795	796	797	798	799	800	801	802	803	804
1718	805	806	807	808	809	810	811	812	813	814	815	816
1719	817	818	819	820	821	822	823	824	825	826	827	828
1720	829	830	831	832	833	834	835	836	837	838	839	840
1721	841	842	843	844	845	846	847	848	849	850	851	852
1722	853	854	855	856	857	858	859	860	861	862	863	864
1723	865	866	867	868	869	870	871	872	873	874	875	876
1724	877	878	879	880	881	882	883	884	885	886	887	888
1725	889	890	891	892	893	894	895	896	897	898	899	900
1726	901	902	903	904	905	906	907	908	909	910	911	912
1727	913	914	915	916	917	918	919	920	921	922	923	924
1728	925	926	927	928	929	930	931	932	933	934	935	936
1729	937	938	939	940	941	942	943	944	945	946	947	948
1730	949	950	951	952	953	954	955	956	957	958	959	960
1731	961	962	963	964	965	966	967	968	969	970	971	972
1732	973	974	975	976	977	978	979	980	981	982	983	984
1733	985	986	987	988	989	990	991	992	993	994	995	996
1734	997	998	999	1,000	1,001	1,002	1,003	1,004	1,005	1,006	1,007	1,008
1735	1,009	1,010	1,011	1,012	1,013	1,014	1,015	1,016	1,017	1,018	1,019	1,020
1736	1,021	1,022	1,023	1,024	1,025	1,026	1,027	1,028	1,029	1,030	1,031	1,032
1737	1,033	1,034	1,035	1,036	1,037	1,038	1,039	1,040	1,041	1,042	1,043	1,044
1738	1,045	1,046	1,047	1,048	1,049	1,050	1,051	1,052	1,053	1,054	1,055	1,056
1739	1,057	1,058	1,059	1.060	1,061	1,062	1,063	1,064	1,065	1,066	1,067	1,068
1740	1,069	1,070	1,071	1,072	1,073	1,074	1,075	1,076	1,077	1,078	1,079	1,080
1741	1,081	1,082	1,083	1,084	1,085	1,086	1,087	1,088	1,089	1,090	1,091	1,092
1742	1,093	1,094	1,095	1,096	1,097	1,098	1,099	1,100	1,101	1,102	1,103	1,104
1743	1,105	1,106	1,107	1,108	1,109	1,110	1,111	1,112	1,113	1,114	1,115	1,116
1744	1,117	1,118	1.119	1,120	1,121	1,122	1,123	1,124	1,125	1,126	1,127	1,128

STANDARD MONTH NUMBERS—CONTINUED

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1745	1,129	1,130	1,131	1,132	1,133	1,134	1,135	1,136	1,137	1,138	1,139	1,140
1746	1,141	1,142	1,143	1,144	1,145	1,146	1,147	1,148	1,149	1,150	1,151	1,152
1747	1,153	1,154	1,155	1,156	1,157	1,158	1,159	1,160	1,161	1,162	1,163	1,164
1748	1,165	1,166	1,167	1,168	1,169	1,170	1,171	1,172	1,173	1,174	1,175	1,176
1749	1,177	1,178	1,179	1,180	1,181	1,182	1,183	1,184	1,185	1,186	1,187	1,188
1750	1,189	1,190	1,191	1,192	1,193	1,194	1,195	1,196	1,197	1,198	1,199	1,200
1751	1,201	1,202	1,203	1,204	1,205	1,206	1,207	1,208	1,209	1,210	1,211	1,212
1752	1,213	1,214	1,215	1,216	1,217	1,218	1,219	1,220	1,221	1,222	1,223	1,224
1753	1,225	1,226	1,227	1,228	1,229	1,230	1,231	1,232	1,233	1,234	1,235	1,236
1754	1,237	1,238	1,239	1,240	1,241	1,242	1,243	1,244	1,245	1,246	1,247	1,248
1755	1,249	1,250	1,251	1,252	1,253	1,254	1,255	1,256	1,257	1,258	1,259	1,260
1756	1,261	1,262	1,263	1,264	1,265	1,266	1,267	1,268	1,269	1,270	1,271	1,272
1757	1,273	1,274	1,275	1,276	1,277	1,278	1,279	1,280	1,281	1,282	1,283	1,284
1758	1,285	1,286	1,287	1,288	1,289	1,290	1,291	1,292	1,293	1,294	1,295	1,296
1759	1,297	1,298	1,299	1,300	1,301	1,302	1,303	1,304	1,305	1,306	1,307	1,308
1760	1,309	1,310	1,311	1,312	1,313	1,314	1,315	1,316	1,317	1,318	1,319	1,320
1761	1,321	1,322	1,323	1,324	1,325	1,326	1,327	1,328	1,329	1,330	1,331	1,332
1762	1,333	1,334	1,335	1,336	1,337	1,338	1,339	1,340	1,341	1,342	1,343	1,344
1763	1,345	1,346	1,347	1,348	1,349	1,350	1,351	1,352	1,353	1,354	1,355	1,356
1764	1,357	1,358	1,359	1,360	1,361	1,362	1,363	1,364	1,365	1,366	1,367	1,368
1765	1,369	1,370	1,371	1,372	1,373	1,374	1,375	1,376	1,377	1,378	1,379	1,380
1766	1,381	1,382	1,383	1,384	1,385	1,386	1,387	1,388	1,389	1,390	1,391	1,392
1767	1,393	1,394	1,395	1,396	1,397	1,398	1,399	1,400	1,401	1,402	1,403	1,404
1768	1,405	1,406	1,407	1,408	1,409	1,410	1,411	1,412	1,413	1,414	1,415	1,416
1769	1,417	1,418	1,419	1,420	1,421	1,422	1,423	1,424	1,425	1,426	1,427	1,428
1770	1,429	1,430	1,431	1,432	1,433	1,434	1,435	1,436	1,437	1,438	1,439	1,440
1771	1,441	1,442	1,443	1,444	1,445	1,446	1,447	1,448	1,449	1,450	1,451	1,452
1772	1,453	1,454	1,455	1,456	1,457	1,458	1,459	1,460	1,461	1,462	1,463	1,464
1773	1,465	1,466	1,467	1,468	1,469	1,470	1,471	1,472	1,473	1,474	1,475	1,476
1774	1,477	1,478	1,479	1,480	1,481	1,482	1,483	1,484	1,485	1,486	1,487	1,488
1775	1,489	1,490	1,491	1,492	1,493	1,494	1,495	1,496	1,497	1,498	1,499	1,500
1776	1,501	1,502	1,503	1,504	1,505	1,506	1,507	1,508	1,509	1,510	1,511	1,512
1777	1,513	1,514	1,515	1,516	1,517	1,518	1,519	1,520	1,521	1,522	1,523	1,524
1778	1,525	1,526	1,527	1,528	1,529	1,530	1,531	1,532	1,533	1,534	1,535	1,536
1779	1,537	1,538	1,539	1,540	1,541	1,542	1,543	1,544	1,545	1,546	1,547	1,548
1780	1,549	1,550	1,551	1,552	1,553	1,554	1,555	1,556	1,557	1,558	1,559	1,560
1781	1,561	1,562	1,563	1,564	1,565	1,566	1,567	1,568	1,569	1,570	1,571	1,572
1782	1,573	1,574	1,575	1,576	1,577	1,578	1,579	1,580	1,581	1,582	1,583	1,584
1783	1,585	1,586	1,587	1,588	1,589	1,590	1,591	1,592	1,593	1,594	1,595	1,596
1784	1,597	1,598	1,599	1,600	1,601	1,602	1,603	1,604	1,605	1,606	1,607	1,608
1785	1,609	1,610	1,611	1,612	1,613	1,614	1,615	1,616	1,617	1,618	1,619	1,620
1786	1,621	1,622	1,623	1,624	1,625	1,626	1,627	1,628	1,629	1,630	1,631	1,632
1787	1,633	1,634	1,635	1,636	1,637	1,638	1,639	1,640	1,641	1,642	1,643	1,644
1788	1,645	1,646	1,647	1,648	1,649	1,650	1,651	1,652	1,653	1,654	1,655	1,656
1789	1,657	1,658	1,659	1,660	1,661	1,662	1,663	1,664	1,665	1,666	1,667	1,668
1790	1,669	1,670	1,671	1,672	1,673	1,674	1,675	1,676	1,677	1,678	1,679	1,680
1791	1,681	1,682	1,683	1,684	1,685	1,686	1,687	1,688	1,689	1,690	1,691	1,692
1792	1,693	1,694	1,695	1,696	1,697	1,698	1,699	1,700	1,701	1,702	1,703	1,704
1793	1,705	1,706	1,707	1,708	1,709	1,710	1,711	1,712	1,713	1,714	1,715	1,716
1794	1,717	1,718	1,719	1,720	1,721	1,722	1,723	1,724	1,725	1,726	1,727	1,728
1795	1,729	1,730	1,731	1,732	1,733	1,734	1,735	1,736	1,737	1,738	1,739	1,740
1796	1,741	1,742	1,743	1,744	1,745	1,746	1,747	1,748	1,749	1,750	1,751	1,752
1797	1,753	1,754	1,755	1,756	1,757	1,758	1,759	1,760	1,761	1,762	1,763	1,764
1798	1,765	1,766	1,767	1,768	1,769	1,770	1,771	1,772	1,773	1,774	1,775	1,776
1799	1,777	1,778	1,779	1,780	1,781	1,782	1,783	1,784	1,785	1,786	1,787	1,788
1800	1,789	1,790	1,791	1,792	1,793	1,794	1,795	1,796	1,797	1,798	1,799	1,800
1801	1,801	1,802	1,803	1,804	1,805	1,806	1,807	1,808	1,809	1,810	1,811	1,812
1802	1,813	1,814	1,815	1,816	1,817	1,818	1,819	1,820	1,821	1,822	1,823	1,824
1803	1,825	1,826	1,827	1,828	1,829	1,830	1,831	1,832	1,833	1,834	1,835	1,836
1804	1,837	1,838	1,839	1,840	1,841	1,842	1,843	1,844	1,845	1,846	1,847	1,848

STANDARD MONTH NUMBERS—CONTINUED

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1805	1,849	1,850	1,851	1,852	1,853	1,854	1,855	1,856	1,857	1,858	1,859	1,860
1806	1,861	1,862	1,863	1,864	1,865	1,866	1,867	1,868	1,869	1,870	1,871	1,872
1807	1,873	1,874	1,875	1,876	1,877	1,878	1,879	1,880	1,881	1,882	1,883	1,884
1808	1,885	1,886	1,887	1,888	1,889	1,890	1,891	1,892	1,893	1,894	1,895	1,896
1809	1,897	1,898	1,899	1,900	1,901	1,902	1,903	1,904	1,905	1,906	1,907	1,908
1810	1,909	1,910	1,911	1,912	1,913	1,914	1,915	1,916	1,917	1,918	1,919	1,920
1811	1,921	1,922	1,923	1,924	1,925	1,926	1,927	1,928	1,929	1,930	1,931	1,932
1812	1,933	1,934	1,935	1,936	1,937	1,938	1,939	1,940	1,941	1,942	1,943	1,944
1813	1,945	1,946	1,947	1,948	1,949	1,950	1,951	1,952	1,953	1,954	1,955	1,956
1814	1,957	1,958	1,959	1,960	1,961	1,962	1,963	1,964	1,965	1,966	1,967	1,968
1815	1,969	1,970	1,971	1,972	1,973	1,974	1,975	1,976	1,977	1,978	1,979	1,980
1816	1,981	1,982	1,983	1,984	1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992
1817	1,993	1,994	1,995	1,996	1,997	1,998	1,999	2,000	2,001	2,002	2,003	2,004
1818	2,005	2,006	2,007	2,008	2,009	2,010	2,011	2,012	2,013	2,014	2,015	2,016
1819	2,017	2,018	2,019	2,020	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028
1820	2,029	2,030	2,031	2,032	2,033	2,034	2,035	2,036	2,037	2,038	2,039	2,040
1821	2,041	2,042	2,043	2,044	2,045	2,046	2,047	2,048	2,049	2,050	2,051	2,052
1822	2,053	2,054	2,055	2,056	2,057	2,058	2,059	2,060	2,061	2,062	2,063	2,064
1823	2,065	2,066	2,067	2,068	2,069	2,070	2,071	2,072	2,073	2,074	2,075	2,076
1824	2,077	2,078	2,079	2,080	2,081	2,082	2,083	2,084	2,085	2,086	2,087	2,088
1825	2,089	2,090	2,091	2,092	2,093	2,094	2,095	2,096	2,097	2,098	2,099	2,100
1826	2,101	2,102	2,103	2,104	2,105	2,106	2,107	2,108	2,109	2,110	2,111	2,112
1827	2,113	2,114	2,115	2,116	2,117	2,118	2,119	2,120	2,121	2,122	2,123	2,124
1828	2,125	2,126	2,127	2,128	2,129	2,130	2,131	2,132	2,133	2,134	2,135	2,136
1829	2,137	2,138	2,139	2,140	2,141	2,142	2,143	2,144	2,145	2,146	2,147	2,148
1830	2,149	2,150	2,151	2,152	2,153	2,154	2,155	2,156	2,157	2,158	2,159	2,160
1831	2,161	2,162	2,163	2,164	2,165	2,166	2,167	2,168	2,169	2,170	2,171	2,172
1832	2,173	2,174	2,175	2,176	2,177	2,178	2,179	2,180	2,181	2,182	2,183	2,184
1833	2,185	2,186	2,187	2,188	2,189	2,190	2,191	2,192	2,193	2,194	2,195	2,196
1834	2,197	2,198	2,199	2,200	2,201	2,202	2,203	2,204	2,205	2,206	2,207	2,208
1835	2,209	2,210	2,211	2,212	2,213	2,214	2,215	2,216	2,217	2,218	2,219	2,220
1836	2,221	2,222	2,223	2,224	2,225	2,226	2,227	2,228	2,229	2,230	2,231	2,232
1837	2,233	2,234	2,235	2,236	2,237	2,238	2,239	2,240	2,241	2,242	2,243	2,244
1838	2,245	2,246	2,247	2,248	2,249	2,250	2,251	2,252	2,253	2,254	2,255	2,256
1839	2,257	2,258	2,259	2,260	2,261	2,262	2,263	2,264	2,265	2,266	2,267	2,268
1840	2,269	2,270	2,271	2,272	2,273	2,274	2,275	2,276	2,277	2,278	2,279	2,280
1841	2,281	2,282	2,283	2,284	2,285	2,286	2,287	2,288	2,289	2,290	2,291	2,292
1842	2,293	2,294	2,295	2,296	2,297	2,298	2,299	2,300	2,301	2,302	2,303	2,304
1843	2,305	2,306	2,307	2,308	2,309	2,310	2,311	2,312	2,313	2,314	2,315	2,316
1844	2,317	2,318	2,319	2,320	2,321	2,322	2,323	2,324	2,325	2,326	2,327	2,328
1845	2,329	2,330	2,331	2,332	2,333	2,334	2,335	2,336	2,337	2,338	2,339	2,340
1846	2,341	2,342	2,343	2,344	2,345	2,346	2,347	2,348	2,349	2,350	2,351	2,352
1847	2,353	2,354	2,355	2,356	2,357	2,358	2,359	2,360	2,361	2,362	2,363	2,364
1848	2,365	2,366	2,367	2,368	2,369	2,370	2,371	2,372	2,373	2,374	2,375	2,376
1849	2,377	2,378	2,379	2,380	2,381	2,382	2,383	2,384	2,385	2,386	2,387	2,388
1850	2,389	2,390	2,391	2,392	2,393	2,394	2,395	2,396	2,397	2,398	2,399	2,400
1851	2,401	2,402	2,403	2,404	2,405	2,406	2,407	2,408	2,409	2,410	2,411	2,412
1852	2,413	2,414	2,415	2,416	2,417	2,418	2,419	2,420	2,421	2,422	2,423	2,424
1853	2,425	2,426	2,427	2,428	2,429	2,430	2,431	2,432	2,433	2,434	2,435	2,436
1854	2,437	2,438	2,439	2,440	2,441	2,442	2,443	2,444	2,445	2,446	2,447	2,448
1855	2,449	2,450	2,451	2,452	2,453	2,454	2,455	2,456	2,457	2,458	2,459	2,460
1856	2,461	2,462	2,463	2,464	2,465	2,466	2,467	2,468	2,469	2,470	2,471	2,472
1857	2,473	2,474	2,475	2,476	2,477	2,478	2,479	2,480	2,481	2,482	2,483	2,484
1858	2,485	2,486	2,487	2,488	2,489	2,490	2,491	2,492	2,493	2,494	2,495	2,496
1859	2,497	2,498	2,499	2,500	2,501	2,502	2,503	2,504	2,505	2,506	2,507	2,508
1860	2,509	2,510	2,511	2,512	2,513	2,514	2,515	2,516	2,517	2,518	2,519	2,520
1861	2,521	2,522	2,523	2,524	2,525	2,526	2,527	2,528	2,529	2,530	2,531	2,532
1862	2,533	2,534	2,535	2,536	2,537	2,538	2,539	2,540	2,541	2,542	2,543	2,544
1863	2,545	2,546	2,547	2,548	2,549	2,550	2,551	2,552	2,553	2,554	2,555	2,556
1864	2,557	2,558	2,559	2,560	2,561	2,562	2,563	2,564	2,565	2,566	2,567	2,568

STANDARD MONTH NUMBERS—CONTINUED

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1865	2,569	2,570	2,571	2,572	2,573	2,574	2,575	2,576	2,577	2,578	2,579	2,580
1866	2,581	2,582	2,583	2,584	2,585	2,586	2,587	2,588	2,589	2,590	2,591	2,592
1867	2,593	2,594	2,595	2,596	2,597	2,598	2,599	2,600	2,601	2,602	2,603	2,604
1868	2,605	2,606	2,607	2,608	2,609	2,610	2,611	2,612	2,613	2,614	2,615	2,616
1869	2,617	2,618	2,619	2,620	2,621	2,622	2,623	2,624	2,625	2,626	2,627	2,628
1870	2,629	2,630	2,631	2,632	2,633	2,634	2,635	2,636	2,637	2,638	2,639	2,640
1871	2,641	2,642	2,643	2,644	2,645	2,646	2,647	2,648	2,649	2,650	2,651	2,652
1872	2,653	2,654	2,655	2,656	2,657	2,658	2,659	2,660	2,661	2,662	2,663	2,664
1873	2,665	2,666	2,667	2,668	2,669	2,670	2,671	2,672	2,673	2,674	2,675	2,676
1874	2,677	2,678	2,679	2,680	2,681	2,682	2,683	2,684	2,685	2,686	2,687	2,688
1875	2,689	2,690	2,691	2,692	2,693	2,694	2,695	2,696	2,697	2,698	2,699	2,700
1876	2,701	2,702	2,703	2,704	2,705	2,706	2,707	2,708	2,709	2,710	2,711	2,712
1877	2,713	2,714	2,715	2,716	2,717	2,718	2,719	2,720	2,721	2,722	2,723	2,724
1878	2,725	2,726	2,727	2,728	2,729	2,730	2,731	2,732	2,733	2,734	2,735	2,736
1879	2,737	2,738	2,739	2,740	2,741	2,742	2,743	2,744	2,745	2,746	2,747	2,748
1880	2,749	2,750	2,751	2,752	2,753	2,754	2,755	2,756	2,757	2,758	2,759	2,760
1881	2,761	2,762	2,763	2,764	2,765	2,766	2,767	2,768	2,769	2,770	2,771	2,772
1882	2,773	2,774	2,775	2,776	2,777	2,778	2,779	2,780	2,781	2,782	2,783	2,784
1883	2,785	2,786	2,787	2,788	2,789	2,790	2,791	2,792	2,793	2,794	2,795	2,796
1884	2,797	2,798	2,799	2,800	2,801	2,802	2,803	2,804	2,805	2,806	2,807	2,808
1885	2,809	2,810	2,811	2,812	2,813	2,814	2,815	2,816	2,817	2,818	2,819	2,820
1886	2,821	2,822	2,823	2,824	2,825	2,826	2,827	2,828	2,829	2,830	2,831	2,832
1887	2,833	2,834	2,835	2,836	2,837	2,838	2,839	2,840	2,841	2,842	2,843	2,844
1888	2,845	2,846	2,847	2,848	2,849	2,850	2,851	2,852	2,853	2,854	2,855	2,856
1889	2,857	2,858	2,859	2,860	2,861	2,862	2,863	2,864	2,865	2,866	2,867	2,868
1890	2,869	2,870	2,871	2,872	2,873	2,874	2,875	2,876	2,877	2,878	2,879	2,880
1891	2,881	2,882	2,883	2,884	2,885	2,886	2,887	2,888	2,889	2,890	2,891	2,892
1892	2,893	2,894	2,895	2,896	2,897	2,898	2,899	2,900	2,901	2,902	2,903	2,904
1893	2,905	2,906	2,907	2,908	2,909	2,910	2,911	2,912	2,913	2,914	2,915	2,916
1894	2,917	2,918	2,919	2,920	2,921	2,922	2,923	2,924	2,925	2,926	2,927	2,928
1895	2,929	2,930	2,931	2,932	2,933	2,934	2,935	2,936	2,937	2,938	2,939	2,940
1896	2,941	2,942	2,943	2,944	2,945	2,946	2,947	2,948	2,949	2,950	2,951	2,952
1897	2,953	2,954	2,955	2,956	2,957	2,958	2,959	2,960	2,961	2,962	2,963	2,964
1898	2,965	2,966	2,967	2,968	2,969	2,970	2,971	2,972	2,973	2,974	2,975	2,976
1899	2,977	2,978	2,979	2,980	2,981	2,982	2,983	2,984	2,985	2,986	2,987	2,988
1900	2,989	2,990	2,991	2,992	2,993	2,994	2,995	2,996	2,997	2,998	2,999	3,000
1901	3,001	3,002	3,003	3,004	3,005	3,006	3,007	3,008	3,009	3,010	3,011	3,012
1902	3,013	3,014	3,015	3,016	3,017	3,018	3,019	3,020	3,021	3,022	3,023	3,024
1903	3,025	3,026	3,027	3,028	3,029	3,030	3,031	3,032	3,033	3,034	3,035	3,036
1904	3,037	3,038	3,039	3,040	3,041	3,042	3,043	3,044	3,045	3,046	3,047	3,048
1905	3,049	3,050	3,051	3,052	3,053	3,054	3,055	3,056	3,057	3,058	3,059	3,060
1906	3,061	3,062	3,063	3,064	3,065	3,066	3,067	3,068	3,069	3,070	3,071	3,072
1907	3,073	3,074	3,075	3,076	3,077	3,078	3,079	3,080	3,081	3,082	3,083	3,084
1908	3,085	3,086	3,087	3,088	3,089	3,090	3,091	3,092	3,093	3,094	3,095	3,096
1909	3,097	3,098	3,099	3,100	3,101	3,102	3,103	3,104	3,105	3,106	3,107	3,108
1910	3,109	3,110	3,111	3,112	3,113	3,114	3,115	3,116	3,117	3,118	3,119	3,120
1911	3,121	3,122	3,123	3,124	3,125	3,126	3,127	3,128	3,129	3,130	3,131	3,132
1912	3,133	3,134	3,135	3,136	3,137	3,138	3,139	3,140	3,141	3,142	3,143	3,144
1913	3,145	3,146	3,147	3,148	3,149	3,150	3,151	3,152	3,153	3,154	3,155	3,156
1914	3,157	3,158	3,159	3,160	3,161	3,162	3,163	3,164	3,165	3,166	3,167	3,168
1915	3,169	3,170	3,171	3,172	3,173	3,174	3,175	3,176	3,177	3,178	3,179	3,180
1916	3,181	3,182	3,183	3,184	3,185	3,186	3,187	3,188	3,189	3,190	3,191	3,192
1917	3,193	3,194	3,195	3,196	3,197	3,198	3,199	3,200	3,201	3,202	3,203	3,204
1918	3,205	3,206	3,207	3,208	3,209	3,210	3,211	3,212	3,213	3,214	3,215	3,216
1919	3,217	3,218	3,219	3,220	3,221	3,222	3,223	3,224	3,225	3,226	3,227	3,228
1920	3,229	3,230	3,231	3,232	3,233	3,234	3,235	3,236	3,237	3,238	3,239	3,240
1921	3,241	3,242	3,243	3,244	3,245	3,246	3,247	3,248	3,249	3,250	3,251	3,252
1922	3,253	3,254	3,255	3,256	3,257	3,258	3,259	3,260	3,261	3,262	3,263	3,264
1923	3,265	3,266	3,267	3,268	3,269	3,270	3,271	3,272	3,273	3,274	3,275	3,276
1924	3,277	3,278	3,279	3,280	3,281	3,282	3,283	3,284	3,285	3,286	3,287	3,288

STANDARD MONTH NUMBERS—CONTINUED

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1925	3,289	3,290	3,291	3,292	3,293	3,294	3,295	3,296	3,297	3,298	3,299	3,300
1926	3,301	3,302	3,303	3,304	3,305	3,306	3,307	3,308	3,309	3,310	3,311	3,312
1927	3,313	3,314	3,315	3,316	3,317	3,318	3,319	3,320	3,321	3,322	3,323	3,324
1928	3,325	3,326	3,327	3,328	3,329	3,330	3,331	3,332	3,333	3,334	3,335	3,336
1929	3,337	3,338	3,339	3,340	3,341	3,342	3,343	3,344	3,345	3,346	3,347	3,348
1930	3,349	3,350	3,351	3,352	3,353	3,354	3,355	3,356	3,357	3,358	3,359	3,360
1931	3,361	3,362	3,363	3,364	3,365	3,366	3,367	3,368	3,369	3,370	3,371	3,372
1932	3,373	3,374	3,375	3,376	3,377	3,378	3,379	3,380	3,381	3,382	3,383	3,384
1933	3,385	3,386	3,387	3,388	3,389	3,390	3,391	3,392	3,393	3,394	3,395	3,396
1934	3,397	3,398	3,399	3,400	3,401	3,402	3,403	3,404	3,405	3,406	3,407	3,408
1935	3,409	3,410	3,411	3,412	3,413	3,414	3,415	3,416	3,417	3,418	3,419	3,420
1936	3,421	3,422	3,423	3,424	3,425	3,426	3,427	3,428	3,429	3,430	3,431	3,432
1937	3,433	3,434	3,435	3,436	3,437	3,438	3,439	3,440	3,441	3,442	3,443	3,444
1938	3,445	3,446	3,447	3,448	3,449	3,450	3,451	3,452	3,453	3,454	3,455	3,456
1939	3,457	3,458	3,459	3,460	3,461	3,462	3,463	3,464	3,465	3,466	3,467	3,468
1940	3,469	3,470	3,471	3,472	3,473	3,474	3,475	3,476	3,477	3,478	3,479	3,480
1941	3,481	3,482	3,483	3,484	3,485	3,486	3,487	3,488	3,489	3,490	3,491	3,492
1942	3,493	3,494	3,495	3,496	3,497	3,498	3,499	3,500	3,501	3,502	3,503	3,504
1943	3,505	3,506	3,507	3,508	3,509	3,510	3,511	3,512	3,513	3,514	3,515	3,516
1944	3,517	3,518	3,519	3,520	3,521	3,522	3,523	3,524	3,525	3,526	3,527	3,528
1945	3,529	3,530	3,531	3,532	3,533	3,534	3,535	3,536	3,537	3,538	3,539	3,540
1946	3,541	3,542	3,543	3,544	3,545	3,546	3,547	3,548	3,549	3,550	3,551	3,552
1947	3,553	3,554	3,555	3,556	3,557	3,558	3,559	3,560	3,561	3,562	3,563	3,564
1948	3,565	3,566	3,567	3,568	3,569	3,570	3,571	3,572	3,573	3,574	3,575	3,576
1949	3,577	3,578	3,579	3,580	3,581	3,582	3,583	3,584	3,585	3,586	3,587	3,588
1950	3,589	3,590	3,591	3,592	3,593	3,594	3,595	3,596	3,597	3,598	3,599	3,600
1951	3,601	3,602	3,603	3,604	3,605	3,606	3,607	3,608	3,609	3,610	3,611	3,612
1952	3,613	3,614	3,615	3,616	3,617	3,618	3,619	3,620	3,621	3,622	3,623	3,624
1953	3,625	3,626	3,627	3,628	3,629	3,630	3,631	3,632	3,633	3,634	3,635	3,636
1954	3,637	3,638	3,639	3,640	3,641	3,642	3,643	3,644	3,645	3,646	3,647	3,648
1955	3,649	3,650	3,651	3,652	3,653	3,654	3,655	3,656	3,657	3,658	3,659	3,660
1956	3,661	3,662	3,663	3,664	3,665	3,666	3,667	3,668	3,669	3,670	3,671	3,672
1957	3,673	3,674	3,675	3,676	3,677	3,678	3,679	3,680	3,681	3,682	3,683	3,684
1958	3,685	3,686	3,687	3,688	3,689	3,690	3,691	3,692	3,693	3,694	3,695	3,696
1959	3,697	3,698	3,699	3,700	3,701	3,702	3,703	3,704	3,705	3,706	3,707	3,708
1960	3,709	3,710	3,711	3,712	3,713	3,714	3,715	3,716	3,717	3,718	3,719	3,720
1961	3,721	3,722	3,723	3,724	3,725	3,726	3,727	3,728	3,729	3,730	3,731	3,732
1962	3,733	3,734	3,735	3,736	3,737	3,738	3,739	3,740	3,741	3,742	3,743	3,744
1963	3,745	3,746	3,747	3,748	3,749	3,750	3,751	3,752	3,753	3,754	3,755	3,756
1964	3,757	3,758	3,759	3,760	3,761	3,762	3,763	3,764	3,765	3,766	3,767	3,768
1965	3,769	3,770	3,771	3,772	3,773	3,774	3,775	3,776	3,777	3,778	3,779	3,780
1966	3,781	3,782	3,783	3,784	3,785	3,786	3,787	3,788	3,789	3,790	3,791	3,792
1967	3,793	3,794	3,795	3,796	3,797	3,798	3,799	3,800	3,801	3,802	3,803	3,804
1968	3,805	3,806	3,807	3,808	3,809	3,810	3,811	3,812	3,813	3,814	3,815	3,816
1969	3,817	3,818	3,819	3,820	3,821	3,822	3,823	3,824	3,825	3,826	3,827	3,828
1970	3,829	3,830	3,831	3,832	3,833	3,834	3,835	3,836	3,837	3,838	3,839	3,840
1971	3,841	3,842	3,843	3,844	3,845	3,846	3,847	3,848	3,849	3,850	3,851	3,852
1972	3,853	3,854	3,855	3,856	3,857	3,858	3,859	3,860	3,861	3,862	3,863	3,864
1973	3,865	3,866	3,867	3,868	3,869	3,870	3,871	3,872	3,873	3,874	3,875	3,876
1974	3,877	3,878	3,879	3,880	3,881	3,882	3,883	3,884	3,885	3,886	3,887	3,888
1975	3,889	3,890	3,891	3,892	3,893	3,894	3,895	3,896	3,897	3,898	3,899	3,900
1976	3,901	3,902	3,903	3,904	3,905	3,906	3,907	3,908	3,909	3,910	3,811	3,912
1977	3,913	3,914	3,915	3,916	3,917	3,918	3,919	3,920	3,921	3,922	3,923	3,924
1978	3,925	3,926	3,927	3,928	3,929	3,930	3,931	3,932	3,933	3,934	3,935	3,936
1979	3,937	3,938	3,939	3,940	3,941	3,942	3,943	3,944	3,945	3,946	3,947	3,948
1980	3,949	3,950	3,951	3,952	3,953	3,954	3,955	3,956	3,957	3,958	3,959	3,960
1981	3,961	3,962	3,963	3,964	3,965	3,966	3,967	3,968	3,969	3,970	3,971	3,972
1982	3,973	3,974	3,975	3,976	3,977	3,978	3,979	3,980	3,981	3,982	3,983	3,984
1983	3,985	3,986	3,987	3,988	3,989	3,990	3,991	3,992	3,993	3,994	3,893	3,996
1984	3,997	3,998	3,999	4,000	4,001	4,002	4,003	4,004	4,005	4,006	4,007	4,008